



General

Guideline Title

Management of labor.

Bibliographic Source(s)

Creedon D, Akkerman D, Atwood L, Bates L, Harper C, Levin A, McCall C, Peterson D, Rose C, Setterlund L, Walkes B, Wingeier R. Management of labor. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2013 Mar. 66 p. [113 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Institute for Clinical Systems Improvement (ICSI). Management of labor. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2011 May. 61 p.

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

[August 31, 2016 – Opioid pain and cough medicines combined with benzodiazepines](#)

: A U.S. Food and Drug Administration (FDA) review has found that the growing combined use of opioid medicines with benzodiazepines or other drugs that depress the central nervous system (CNS) has resulted in serious side effects, including slowed or difficult breathing and deaths. FDA is adding Boxed Warnings to the drug labeling of prescription opioid pain and prescription opioid cough medicines and benzodiazepines.

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC) and the Institute for Clinical Systems Improvement

(ICSI): For a description of what has changed since the previous version of this guidance, refer to Summary of Changes Report – May 2013 (see the "Guideline Availability" field). In addition, ICSI has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. This document is in transition to the GRADE methodology. Transition steps incorporating GRADE methodology for this document include the following:

Priority placed upon available systematic reviews in literature searches.

All existing Class A (randomized controlled trials [RCTs]) studies have been considered as high quality evidence unless specified differently by a work group member.

All existing Class B, C and D studies have been considered as low quality evidence unless specified differently by a work group member.

All existing Class M and R studies are identified by study design versus assigning a quality of evidence (see Crosswalk between ICSI Evidence Grading System and GRADE below in the "Definitions" section).

All new literature considered by the work group for this revision has been assessed using GRADE methodology.

The recommendations for management of labor are presented in the form of six algorithms with a total of 89 components, accompanied by detailed annotations. Algorithms are provided in the original guideline document at the ICSI Web site for: Management of Labor Main Algorithm, Management of Signs/Symptoms of Preterm Labor (PTL), Management of Critical Event, Vaginal Birth after Caesarean (VBAC), Management of Labor Dystocia, and Intrapartum Fetal Heart Rate (FHR) Management (see the "Guideline Availability" field). Clinical highlights and selected annotations (numbered to correspond with the algorithm) follow.

Class of evidence (Low Quality, Moderate Quality, High Quality, Meta-analysis, Systematic Review, Decision Analysis, Cost-Effectiveness Analysis, Guideline, and Reference) ratings and key conclusion grades (I-III, Not Assignable) are defined at the end of the "Major Recommendations" field.

Clinical Highlights

Patients should be assessed for labor or rupture of membranes before being admitted.

Labor is defined as regular uterine contractions that are causing cervical effacement and dilation and the cervix is dilated at least 3 cm.

Rupture of membranes can be confirmed by checking for pooling and ferning, a nitrazine test, or with a commercially available indicator such as AmniSure.

(Annotation #5)

Assess fetal well-being with either intermittent auscultation or continuous electronic fetal heart rate monitoring. *(Annotation #12)*

Assess patient's level of risk on presentation. *(Annotation #13; Aim #3)*

Initiate treatment for preterm labor as soon as possible after the diagnosis is established.

(Annotation #21; Aim #1)

Women with preterm labor at appropriate gestational age should receive a course of antepartum steroids to promote fetal lung maturity. *(Annotations #35, 43, 48; Aim #1)*

Active labor is defined as 6 cm or greater of cervical dilation. *(Annotation #64)*

Conduct regular cervical checks (cervical checks afford best opportunity to detect labor progress and prevent failure to progress). *(Annotation #66)*

Augment with oxytocin to achieve adequate labor for 2 to 4 hours for protracted Stage I labor. *(Annotation #67)*

If patient is in Stage II labor and is not making progress, initiate management of protraction disorders (positioning, oxytocin augmentation, obstetrical [OB]/surgical consult). *(Annotation #75; Aim #2)*

When necessary, discontinue oxytocin and initiate intrauterine resuscitation such as maternal position, cervical exam for cord prolapse, monitoring maternal blood pressure, assessment for uterine hyperstimulation, and amnioinfusion. *(Annotation #84; Aim #4)*

Recognize and manage fetal heart rate abnormal patterns. (*Annotation #82; Aim #4*)

Management of Labor Main Algorithm Annotations

Triage for Symptoms of Labor

Hospital and/or clinic triage for the labor patient will include these questions. Triage staff will assess general questions from OB experience. Some questions may require more details for assessment. Generally, the patient is encouraged to remain home as long as possible. The caregiver will manage any/all medical concerns according to accepted standards.

General Questions

Are you having contractions?

Is this your first baby?

Was your cervix dilated at least 2 to 3 cm on your last office visit?

Did you have medical complications during your pregnancy? Get specifics.

Are you at term? (What is your estimated date of conception?)

Specific Questions

Is your baby moving as usual?

If no, advise go to hospital.

Has your water broken?

If yes, advise go to hospital.

Are you bleeding?

If yes, advise go to hospital.

Are you having unbearable contractions?

If yes, advise go to hospital.

Admit for Labor?

Labor is defined as:

Spontaneous contractions at least 2 per 15 minutes and at least two of the following:

Complete effacement of cervix

Cervical dilation 3 cm or greater (cervical exam #1)

Other cervical changes

Spontaneous rupturing of membrane (SRM)

Rupture of membranes can be confirmed by checking for pooling and ferning, a nitrazine test or with a commercially available indicator such as AmniSure.

Only patients who meet this definition of labor should be admitted for careful management of labor. Careful assessment of presenting patients is critical.

Patient Education for Reassurance/Observe and Reevaluate/Consider Labor Induction if Appropriate

When a patient presents to hospital, and assessment shows the patient is NOT in labor, patient education will include signs to look for, changes to assess, and reassurance that she can come back to the hospital when changes occur. When the caregiver prefers to hold and observe the patient, a reassessment must be conducted prior to release from the hospital.

In 2006, approximately one in five labors was induced in the United States. This rate has doubled since 1990 and is thought to be responsible, at least in part, for the increased Caesarean section rate, which is currently 32% in the United States [*Guideline*]. There are numerous circumstances that could warrant induction of labor. Broadly, such circumstances are divided into two categories: medical and elective. These categories are discussed in turn.

Medical Inductions

Medical inductions are considered for indications in which delivery is judged to be of lesser risk to maternal or fetal health than continuation of the pregnancy. Some of those indications include

gestational hypertension, pre-eclampsia, eclampsia, placental abruption, premature rupture of membranes, post-term pregnancy, diabetes mellitus, renal disease, antiphospholipid syndrome, chorioamnionitis, oligohydramnios and fetal growth restriction. This list is not comprehensive and other factors, though not strictly medical, may be a consideration, too.

Elective Inductions

Elective deliveries are deliveries initiated without a specific medical indication. These include elective inductions of labor (IOLs) and elective Caesarean deliveries (primary or repeat). Elective IOLs are frequently performed for patient or clinician convenience, although other psychological factors may be involved. The most common reason for an elective Caesarean delivery is a repeat Caesarean.

Induction Decision-Making

While the decision to perform an induction rests with patient and her clinician, there are important considerations and outcomes that should be included as part of this decision. For each case, the risks to the fetus for delivery at the current gestational age (timing of induction), the condition of the cervix (cervical favorability), and the clinician's assessment of the risk to the fetus and mother in continuing the pregnancy (list of medical indications), must be weighed in deciding on timing and mode of delivery. See Appendix A, "ICSI Shared Decision-Making Model," in the original guideline document.

Timing of Induction

Although "term" is generally considered after 37 weeks, there is a substantial body of evidence that delivery prior to 39 completed weeks gestation is associated with increased fetal morbidity such as low Apgars and respiratory distress syndrome [*Low Quality Evidence*]. Because of these risks, American College of Obstetricians and Gynecologists (ACOG) guidelines for elective IOL and elective Caesarean delivery include confirmation that the pregnancy is at least 39 weeks gestation by one of the following dating criteria:

Ultrasound measurement at less than 20 weeks of gestation supports gestational age of 39 weeks or greater.

Fetal heart tones have been documented as present for 30 weeks by Doppler ultrasonography. It has been 36 weeks since a positive serum or urine human chorionic gonadotropin pregnancy test result.

One exception to the rule has been documented: fetal lung maturity if elective delivery is planned prior to 39 weeks. However, recent evidence suggests that even fetuses with documented fetal lung maturity prior to 39 weeks gestation have greater risk of adverse outcomes [*Low Quality Evidence*]. There are also risks associated with post-dates pregnancies; the question of when to induce is still unclear [*Low Quality Evidence*].

Cervical Favorability

With an elective IOL, the goal is to effect a vaginal delivery, so the likelihood of a successful vaginal delivery becomes an important consideration. In 1968, Bishop, using a cervical scoring system that bears his name, evaluated multiparous women induced with oxytocin and found that women with a cervical score >8 had a 95% chance of a vaginal delivery. Since that hallmark study, numerous studies have assessed factors that impact IOL outcomes, and several have shown that nulliparous women with an unfavorable cervix (Bishop score 5 or less) have double the risk of a Caesarean delivery [*Low Quality Evidence*].

Contraindications to Elective IOL

An elective IOL should not be attempted for any women in whom a vaginal delivery would be contraindicated, including transverse fetal lie, placenta previa, vasa previa, active genital herpes simplex virus (HSV) infection, prior classical Caesarean section and umbilical cord prolapse.

See the original guideline document for a list of indications for induction and timing of delivery.

Intrapartum Care

See the ICSI Admission for Labor Management order set (see the "Availability of Companion Documents" field).

Characteristics of care for a patient at time of admission to labor and delivery include:

- Acquisition and evaluation of current medical records

- Cervical exam #2

- Appropriate supportive care/comfort measures as per individual clinician. May include, but are not limited to oral (PO) fluids, fluid balance maintenance, position changes, back rubs, music, ambulation, and tub bath/shower. Management of labor using patient care measures and comfort measures is supported. Documentation of progress of labor using a graphic medium is helpful to patient and staff [*Low Quality Evidence*].

- Adequate pain relief. This includes parenteral analgesics (e.g., fentanyl, nalbuphine hydrochloride [such as Nubain] or hydroxyzine hydrochloride [such as Vistaril]), or epidural or intrathecal opioids for patients in active progressing labor (continued dilation of the cervix) [*Low Quality Evidence*], [*High Quality Evidence*], [*Meta-analysis*].

- Documentation of progress of labor using a graphic medium (partogram) is started on admission.

- Monitoring of fetal heart rate. (See Intrapartum Fetal Heart Rate [FHR] Management algorithm and annotations).

- In nulliparous patients, early amniotomy is a component in the active management of labor protocol and has been shown to reduce the duration of labor [*Systematic Review*], [*High Quality Evidence*].

- Contraindications for amniotomy include:

 - Presentation unknown, floating, or unstable

 - Cervix dilated less than 3 cm

 - Patient refuses

Continuous Electronic Fetal Heart Rate Monitoring or Intermittent Auscultation

The established purpose of FHR monitoring is to identify fetal hypoxemia and acidemia so timely intervention can prevent fetal morbidity and mortality. This is based on the rationale that FHR patterns are indirect markers for hypoxemia and acidemia since the central nervous system controls heart rate. For more information on FHR patterns, see Table 1 in Annotation #82, "FHR Pattern Predictive of Normal Acid-Base Status?" in the original guideline document.

Virtually all obstetrical organizations advise monitoring the FHR during labor, although no trials have compared FHR monitoring to no monitoring [*Low Quality Evidence*]. The most common methods of FHR monitoring are continuous electronic FHR monitoring (EFM) and intermittent auscultation. EFM can be done with an external cardiotocography monitor or an internal (scalp) lead and can provide a continuous assessment of FHR variability and any changes from the baseline heart rate (see Table 1 in Annotation #82 of the original guideline document for EFM definitions). Intermittent auscultation consists of auscultating FHR with either a DeLee stethoscope or a Doppler probe for 30 seconds immediately following a contraction. This monitoring must be performed every 30 minutes during Stage I of labor and every 15 minutes during Stage II [*Guideline*].

Analysis of data from randomized trials comparing these two techniques shows:

- No difference in the rate of intrapartum fetal death rate (approximately 0.5 per 1,000 births with either approach)

- No difference in Apgar scores and neonatal intensive care unit (NICU) admissions

- Neither approach has resulted in a reduction in cerebral palsy or incidence of infant neurologic impairment

Several advantages to EFM have been demonstrated, including a reduction in neonatal seizures

[*Systematic Review*] and better prediction of fetal acidemia at birth [*Meta-analysis*], [*High Quality Evidence*]. One disadvantage to EFM is that it leads to higher assisted deliveries and Caesarean birth without an associated neonatal benefit [*Systematic Review*]. Compared to intermittent auscultation, EFM is associated with a twofold increase in Caesarean delivery rate for non-reassuring FHR patterns.

Any Concerns or Complications?

Risk assessment should be performed on all patients in active labor and is the responsibility of all members of the health care team. This includes, but is not limited to nurses, midwives, and physicians. (See Annotation #5, "Admit for Labor?" for specific definition.)

Initial assessments on entry into labor and delivery area:

- Fetal heart rate assessment [*High Quality Evidence*]

- Patient assessment

- Prenatal risk review

- Risk in labor assessment

High-risk situations may include any of the following conditions:

- Abnormal fetal heart rate (see Intrapartum Fetal Heart Rate [FHR] Monitoring algorithm and annotations)

- Situations that involve arrest or protraction disorders (see Management of Labor Dystocia algorithm and annotations)

- Bleeding

- Breech presentation

- Dysfunctional labor

- Fetal congenital heart disease

- Intrauterine growth restriction

- Maternal congenital heart disease

- Maternal diabetes

- Gestational diabetes

- Maternal hypertension

- Maternal lupus

- Multiple gestation

- Oligohydramnios

- Other serious chronic and acute medical conditions of mother and/or fetus

- Oxytocin use

- Postdate pregnancy (greater than or equal to 42 weeks, per physician discretion)

- Thick meconium

Management of Third Stage of Labor

Active management of the third stage of labor should be offered to women since it reduces the incidence of postpartum hemorrhage due to uterine atony. Active management of the third stage of labor consists of interventions designed to facilitate the delivery of the placenta by increasing uterine contractions and to prevent postpartum hemorrhage by averting uterine atony. The usual components include:

- Administration of uterotonic agents

- Controlled cord traction

- Uterine massage after delivery of the placenta, as appropriate

[*Low Quality Evidence*], [*Systematic Review*]

Management of Signs/Symptoms of Preterm Labor (PTL) Algorithm Annotations

Assessment of Patient with Signs/Symptoms of Possible Preterm Labor

Be certain intervention is appropriate, including certainty of gestational age. A sonogram should be considered if one has not been done.

A thorough medical evaluation should include the following:

Perform a sterile speculum exam to visualize the cervix to:

- Identify any source of bleeding or cervical or vaginal pathology or trauma

- Estimate dilation and effacement of the cervix and look for pooling of amniotic fluid as a sign of ruptured membranes

- Obtain samples for fetal fibronectin testing (fFN)*, consider samples for gonorrhea, chlamydia [*Low Quality Evidence*], wet prep for bacterial vaginosis, group B streptococcus (GBS), and a sample for detecting amniotic fluid with either ferning, nitrazine paper, or AmniSure.

*Perform fFN if patient is between 24 and 33 weeks gestation, and cervix less than 3 cm dilated. A negative fFN was associated with a 97.4% likelihood of the pregnancy continuing more than 7 days after testing [*Low Quality Evidence*].

Perform digital cervical exam if membranes are intact and there is no vaginal bleeding. If ruptured, digital exams increase the risk of infection.

Obtain transvaginal sonogram (TVS) for cervical length for monitoring of patients with sign/symptoms of preterm labor and early cervical change. Cervical length of less than 3.0 cm or a rapidly thinning cervix correlate with increased preterm birth rates [*Low Quality Evidence*].

Perform bedside ultrasound (if feasible) to assess:

- Presentation

- Amniotic fluid index

- Biophysical profile

- Estimated fetal weight

Assess contraction pattern

Assess fetal heart rate pattern and fetal well-being

Obtain urinalysis, urine culture, and urine drug screen (if appropriate)

Consider non-intervention near term if gestational age is well documented. Do not inhibit labor where there is fetal or maternal jeopardy, fetal malformation, or death.

Definition of Preterm Labor

- Labor occurring after 20 and before 37 completed weeks plus

- Clinically documented uterine contractions (4/20 minutes or 6/60 minutes) plus

- Ruptured membranes or

- Intact membranes and cervical dilation greater than 2 cm or

- Intact membranes and cervical effacement greater than 80% or

- Intact membranes and cervical change during observation. These can be measured by changes in dilation or effacement, or by changes in cervical length measured clinically or by ultrasound.

Management of Critical Event Algorithm Annotations

A pregnant woman whose labor begins early (before 37 weeks gestation) may experience a tremendous amount of anxiety and fear, not knowing or understanding the risks to the baby and herself. She will have many questions and concerns. It is imperative that the clinicians caring for the mother and unborn baby communicate with the patient and other family members often and in terms they can understand.

Consider Magnesium Sulfate for Neuroprotection

The work group consensus is that use of magnesium sulfate for the purpose of neuroprotection may be beneficial for gestational age 32 weeks or less.

Several randomized controlled trials [*High Quality Evidence*] have evaluated the administration of magnesium sulfate in clinical situations when preterm delivery is regarded as imminent. Review of these trials has suggested magnesium sulfate does not work well as a tocolytic, but does provide a reduction in both the frequency and severity of cerebral palsy for those infants surviving the immediate intrapartum time frame [*Guideline*], [*Low Quality Evidence*]. The term "neuroprotection" is used to describe the possible indication for magnesium sulfate in these clinical situations. The following points from these studies are important to note:

Very preterm birth (less than 34 weeks) and very low birth weight (less than 1,500 g) are principal risk factors for cerebral palsy, making up between 17% and 32% of all cases of cerebral palsy.

Evidence from population-based registries shows the prevalence of cerebral palsy is rising in very low birth weight infants.

Recent retrospective studies confirm that the increasing prevalence of cerebral palsy is from higher rates in preterm, not term, infants.

The most adequately powered United States randomized controlled trial [*High Quality Evidence*] showed no difference in the primary composite outcome of stillbirth or infant death by 1 year of age or moderate or severe cerebral palsy between the magnesium sulfate group and the placebo group (11.3% and 11.7%, relative risk [RR] 0.97, 95% confidence interval [CI] 0.77-1.23). However, a secondary analysis did show a decreased rate of moderate or severe cerebral palsy in the magnesium sulfate group in infants <28 weeks gestation at randomization (1.9% vs. 3.5% placebo; RR 0.55; 95% CI 0.32-0.95).

Stabilize on Tocolytics/Transfer Mother to Appropriate Level of Care if Possible

Several medications are available for the inhibition of preterm labor (tocolysis). These drugs have different routes of administration, dose schedules, safety profiles, contraindications, and fetal and maternal side effects [*Low Quality Evidence*]. Although several medications can prevent delivery for 24 to 48 hours (allowing time for the administration and beneficial effects of corticosteroid therapy), the longer-term efficacy of all tocolytics is poor [*Systematic Review*].

Calcium Channel Blockers

Nifedipine is the drug most commonly employed from this class of medications for tocolysis. No placebo-controlled trials have evaluated the drug for this indication, but comparative trials have demonstrated the efficacy and safety of the drug [*Systematic Review*], [*High Quality Evidence*].

Beta-Adrenergic-Receptor Agonist

Terbutaline is one of the commonly employed drugs from this class of medications for tocolysis. Available studies show a prolongation of pregnancy similar to the results of calcium channel blockers, but no significant reduction in perinatal morbidity or mortality [*Systematic Review*]. However, the U.S. Food and Drug Administration (FDA) notified health care professionals that oral and injectable terbutaline should not be used in pregnant women for prolonged treatment (beyond 48-72 hours) of preterm labor because of the potential for serious maternal heart problems and death: see the [FDA Web site](#) .

Cyclooxygenase Inhibitors

Indomethacin is the drug most commonly employed from this class of medications for tocolysis. A meta-analysis of three comparative trials with other classes of tocolytics showed a reduction of preterm births (<37 weeks) [*Systematic Review*]. Indomethacin should only be used at less than 32 weeks gestation and only for 48 hours maximum to allow for the administration of antenatal corticosteroids [*Systematic Review*], [*Low Quality Evidence*].

Magnesium Sulfate

Review of the literature does not support the efficacy of magnesium sulfate as a tocolytic. The largest randomized, placebo-controlled trial showed no benefit over placebo [*High Quality Evidence*]. A more recent meta-analysis of 11 studies showed no benefit regarding the risk of preterm birth (less than 37 weeks) or very preterm birth (less than 34 weeks). Moreover, in seven of the trials analyzed, the risk of perinatal mortality was increased for infants exposed to magnesium sulfate [*Low Quality Evidence*], [*Systematic Review*]. The work group does not recommend the use of this medication for this indication.

Maternal Transfer

Maternal transfer to prevent the need for premature neonatal transfer reduces preterm neonatal morbidity and mortality. Very low birth weight infants (less than 1,500 grams) inborn to Level III perinatal centers have lower mortality, reduced incidence of Grade III and Grade IV intraventricular hemorrhage, and lower sensorineural disability rates than outborn infants [*Low Quality Evidence*].

Broad Spectrum Antibiotics/Plan for Delivery

Broad-spectrum antibiotic coverage appears to lengthen the latency from preterm premature rupture of membranes (pPROM) until delivery and/or chorioamnionitis. Antibiotic therapy reduces maternal and neonatal morbidity in women with pPROM. There is no consensus on the choice of antibiotic or dose. A combination of ampicillin and erythromycin is considered protocol in some organizations [*Low Quality Evidence*], [*Systematic Review*], [*High Quality Evidence*].

Initiate Tocolytics, Antenatal Corticosteroids and Antibiotics for Group B Streptococcus (GBS) Prophylaxis

Agents to be considered for tocolytic therapy include terbutaline sulfate, indomethacin, and nifedipine. In February 1997, the FDA alerted practitioners to use caution in the continuous subcutaneous administration of terbutaline sulfate. See Annotation #36, "Consider Magnesium Sulfate for Neuroprotection." See also Annotation #38, "Stabilize on Tocolytics/Transfer Mother to Appropriate Level of Care if Possible," for a detailed discussion of particular tocolytics.

Other considerations for initial management of preterm labor include the following:

- Initiate antenatal corticosteroids if 23 to 34 weeks gestation. Please refer to "Pharmacologic Management of Preterm Labor" below for more information on administration of betamethasone and other corticosteroids.

- Administer intravenous (IV) antibiotic effective against GBS until GBS results are back or if patient is known to be positive for GBS [*Low Quality Evidence*].

- Consider IV magnesium sulfate therapy for neuroprophylaxis if 23 to 32 weeks gestation.

- Activity limitation as indicated

- Order additional laboratory analysis pertinent to tocolytic being used.

Pharmacologic Management of Preterm Labor

Tocolysis and Betamethasone

In most cases, management of preterm labor would include tocolysis for 48 hours and administration of two doses of betamethasone to accelerate fetal lung maturity.

The usual dosage regimen is betamethasone 12 mg intramuscularly (IM) STAT, then repeat in 24 hours.

An alternative medication is dexamethasone for a total of 24 mg (usual dosing regimen is 6 mg IM every 12 hours for four doses).

Treatment should be initiated in women with any symptoms or signs that might herald the onset of preterm delivery or a potential need for induced delivery, rather than waiting until the diagnosis or decision is certain. While a single complete course of antenatal corticosteroids provides significant multiple benefits to the preterm neonate, additional courses should not be used [*High Quality Evidence*].

Treatment should not be withheld because delivery appears to be imminent.

Antenatal corticosteroid therapy for fetal lung maturation reduces mortality, respiratory distress syndrome, and intraventricular hemorrhage in preterm infants. These benefits accrue to preterm neonates across a broad range of gestational ages and are not limited by gender or race [*Systematic Review*]. The benefits of the administration of postnatal surfactant are enhanced by antenatal steroid therapy. No adverse consequences to a policy of administration of antenatal steroids to women in preterm labor have been identified [*Guideline*].

The beneficial effects of corticosteroids are greatest more than 24 hours after beginning

treatment. However, treatment less than 24 hours in duration may improve outcome. Every effort should be made to treat women before spontaneous or elective preterm delivery.

Administer Antibiotic for GBS Prophylaxis Until GBS Results Are Back

Please refer to the GBS prophylaxis guidelines at your institution [*Low Quality Evidence*]. The Agency for Healthcare Research and Quality reviewed literature on the use of antibiotics in preterm labor [*Guideline*].

Vaginal Pool ± Amniocentesis at 32+ Weeks for Fetal Lung Maturity (FLM)

Phosphatidyl glycerol (PG) is a reliable indicator of FLM if present in vaginal pool specimens.

Lecithin/sphingomyelin (L/S) ratio is unreliable if blood and/or meconium are present in the fluid.

Certain assays of PG may be influenced by the presence of heavy growth of *Gardnerella vaginalis*.

Please consult with your local hospital clinical laboratory [*Low Quality Evidence*].

Management of Preterm Labor with Bleeding

In the presence of preterm labor with bleeding, IV access is essential.

The patient should be on strict bed rest.

Blood should be typed and crossmatched.

Complete blood counts (CBCs) with platelets, prothrombin time (PT), partial thromboplastin time (PTT), and fibrinogen

Continue fetal monitoring while bleeding

Deliver for Fetal Distress/Chorioamnionitis/Active Labor/34 Weeks PROM/Other Obstetrical Indicators Under these conditions, the work group recommends delivery [*Low Quality Evidence*]. A "break point" in neonatal morbidity was observed at 34 weeks gestation, which supports induction of labor at this gestational age [*Low Quality Evidence*].

Vaginal Birth After Caesarean (VBAC) Algorithm Annotations

A well-thought-out and informed discussion between the clinician and the patient about VBAC should have occurred prior to the pregnant woman presenting for delivery. Once labor begins, the clinicians must keep the patient informed of the progress (or lack of it) of labor and the status of the baby. If it is likely that a vaginal delivery will be harmful to the baby or the mother, this must be communicated and options discussed.

Special Considerations of Labor Management

Availability of a team capable of performing a Caesarean delivery within a short time [*Guideline*].

Review the prior operative report(s) to ensure that the uterine incision did not involve the contractile portion of the uterus such as a classical incision. A VBAC after a Caesarean with classical incision carries a tenfold higher risk of uterine rupture compared to a low transverse uterine incision.

Intermittent auscultation or continuous electronic FHR monitoring should be done. See Intrapartum Fetal Heart Rate (FHR) Management algorithm.

Augmentation or induction of labor with oxytocin increases the risk of uterine rupture [*Low Quality Evidence*] though the risk is still low (1% to 2.4%). Oxytocin and prostaglandin were not individually associated with uterine rupture except when sequential prostaglandin-oxytocin was used [*Low Quality Evidence*]. A meta-analysis [*Low Quality Evidence*] found sufficient evidence to help in choosing planned induction in VBAC versus elective repeat Caesarean delivery.

The ACOG Committee on Obstetric Practice recommends that misoprostol not be used for induction of labor in women with prior Caesareans or major uterine surgery [*Guideline*].

Use of the Foley bulb catheter has a uterine rupture rate close to that of women laboring spontaneously and has a VBAC success rate similar to that of women who have induced labor [*Low Quality Evidence*]. The intracervical catheter ripening method does not stimulate uterine contractions, which is an advantage for women with previous Caesareans [*Low Quality*

Evidence]. The Society of Obstetricians and Gynecologists of Canada has endorsed the use of the Foley bulb catheter for cervical ripening for women with a low transverse uterine scar. ACOG has no statement either endorsing or discouraging mechanical dilators for cervical ripening in women attempting VBAC [*Guideline*].

Complicated Labor Management

The same considerations for intervention in labor apply to VBACs as for other attempted deliveries.

Complicated labor can be manifested in several categories:

Failure to progress - The same considerations for intervention, including amniotomy, oxytocin, epidural anesthesia/analgesia, apply to VBACs. If indication for primary Caesarean was dystocia, percentage successful VBAC was 77%. Women who required oxytocin for induction had 58% successful vaginal delivery versus 88% who required oxytocin for augmentation [*Low Quality Evidence*].

Fetal distress - See Intrapartum Fetal Heart Rate (FHR) Management algorithm and annotations.

Maternal complications - pre-eclampsia and exacerbation of pre-existing maternal illness are managed similarly in complicated VBAC versus complicated vaginal labor patient.

Uterine rupture - The scarred uterus has an increased potential to rupture. Uterine rupture occurs in between 1/100 and 1/11,000 deliveries depending on whose data one uses and the clinical presentation. The type of scar makes a difference in frequency of rupture and severity of symptoms also (Low Segment Transverse [LST] 0.2–0.8, Classical 4.3 to 8.8, T 4.3 to 8.8, Low Vertical 0.5 to 6.5) [*Low Quality Evidence*].

Rupture through a low segment transverse scar is much more likely to go undetected or produce maternal hypovolemia or gradual fetal distress. Complete rupture with expulsion of fetus or placenta is a true obstetric emergency and can lead to maternal or hypovolemic complication, even death, as well as fetal hypoxia and death.

Conditions that increase the risk for uterine rupture:

Previous uterine injury, Caesarean delivery, myomectomy, etc.

Intrapartum - hyperstimulation, difficult forceps, internal podalic versions, fundal pressure, etc.

Uterine defects not related to trauma (e.g., congenital defect, invasive mole)

Multiple previous Caesarean deliveries

Signs and symptoms of uterine rupture include:

Fetal distress - 50% to 70% of detected ruptures present with abnormal fetal heart (FH) tracings (e.g., variable decelerations that evolve into late decelerations)

Uterine pain, especially pain over previous incision that continues between contractions

Hemorrhage - intra-abdominal, vaginal, or urinary

Palpation of fetal parts

Loss of contractions

Recession of presenting part

Fetal death

Uterine scar disruptions can be classified into three types:

Scar dehiscence - Opening of previous scar, with intact overlying peritoneum (uterine serosa), no expulsion of uterine contents

Incomplete rupture - Opening of previous scar, but not overlying peritoneum, extraperitoneal extrusion of intrauterine contents

Complete rupture - Opening of previous scar and overlying peritoneum with extrusion of intrauterine contents into peritoneal cavity [*Guideline*], [*Low Quality Evidence*].

Management of Labor Dystocia Algorithm Annotations

During labor dystocia the patient plays a significant role as a partner in her care. It is imperative that the clinicians keep the mother informed about her labor and discuss what interventions/options are necessary for a safe delivery of the baby. Explain status, using terms the patient can understand.

Labor Dystocia Diagnosis

Labor abnormalities are classified as either protraction disorders (slower than normal progress) or arrest disorders (complete cessation of progress). Labor dystocia can only be defined when labor is in the active phase. Management of labor dystocia is especially important in nulliparous women to prevent unneeded Caesarean sections [*Low Quality Evidence*].

Friedman provided the definition for "normal labor" in the 1950s. Further observation has shown that the definition of "normal labor" is broader than Friedman's definition. Recent evidence obtained in the context of contemporary obstetric practice suggests that the inflection point for transition from the latent to active phase of labor occurs at 6 cm dilation. It further suggests that progress in the active phase of labor may occur at a faster rate in multiparas than nulliparas [*Low Quality Evidence*]. This has led to more flexibility in the management of abnormal labor, assuming that mother and baby are doing well.

Less than 1 cm Dilation for Two Consecutive Hours and 6 cm Dilation?

Labor progress is measured by checking for cervical change using a digital cervical exam. During the active phase of labor, cervical exams should document at least 1 centimeter dilation every 2 hours. Regular cervical checks during active labor afford the best opportunity to assess the progress of labor and to diagnose labor with abnormal progress.

At least one clinical trial testing the effectiveness of active management of labor in reducing Caesarean deliveries used hourly cervical exams; other studies have used every-two-hour exams. The "two-hour" rule for determining dilatation has been challenged; however, there is evidence indicating that in both nulliparas and multiparas, it may take up to 2 hours to demonstrate 1 cm of change in cervical dilation during the active phase of labor [*Low Quality Evidence*], [*Guideline*], [*High Quality Evidence*].

Management of Protracted Labor Stage I

If the patient in Stage I labor is not making progress, management of protraction disorders will include evaluating the potential causes and directing management appropriately [*High Quality Evidence*].

Power: hypocontractile uterine activity is the most common cause of first stage of labor abnormalities. Adequate contractions are defined as a minimum of 200 Montevideo units in 10 minutes.

Possible interventions:

IV fluids (IV fluids 150 cc/hr may decrease the need for oxytocin augmentation) [*High Quality Evidence*].

Artificial rupture of membranes if membranes are intact and there are no contraindications. (See Annotation #12, "Intrapartum Care.") Although amniotomy is often performed in cases of protracted labor as an isolated intervention, there is evidence that this does not shorten the duration of labor nor reduce Caesarean delivery [*Systematic Review*].

Discontinuing or reducing epidural anesthesia, as the use of epidurals has been shown to increase the length of labor. However, there is no increased rate of Caesarean birth for dystocia when epidural anesthesia is in use [*Low Quality Evidence*].

Oxytocin has been associated with tachysystole (>75 contractions per 10 minutes) [*Guideline*]. The use of oxytocin augmentation has been shown to shorten labor by hours [*High Quality Evidence*].

Contraindications to oxytocin augmentation include:

- Unknown presentation or floating/unstable
- Patient refusal
- Inability to monitor contractions adequately
- Passenger: check for malposition, malpresentation, macrosomia

Passageway: is pelvis adequate? Is there cephalopelvic disproportion?

Obtain an obstetrical/surgical consult if necessary. Cesarean delivery is performed when there is an arrest of labor: patient has not made progress for 2 to 4 hours after strength of contractions deemed adequate (regardless of oxytocin dosage or duration of oxytocin).

Extending time of observation to 4 hours before operative treatment has been shown to decrease the Cesarean delivery rate for arrested labor [*Low Quality Evidence*].

Fetal Head Descent Greater than 1 cm/Hour?

When patient has reached Stage II labor, a reassessment at least every 30 minutes for 2 consecutive hours is done to assess descent of the fetus and rotation of the fetus. If the patient is making appropriate progress, the caregiver can anticipate vaginal delivery. Fetal descent should be greater than 1 cm per hour.

If labor is not progressing, consider internal monitor to measure strength of uterine contractions. After 2 hours of internal monitoring there should be enough evidence to determine if patient is making progress [*Low Quality Evidence*].

Relative contraindications to direct, invasive monitoring include human immunodeficiency virus (HIV) maternal infection, certain fetal presentations, and conditions that preclude vaginal examinations such as placenta previa or undiagnosed vaginal bleeding [*Guideline*].

Management of Protracted Labor — Stage II Labor

If the patient in Stage II labor is not making progress, management of protraction disorders will include evaluating the potential causes and directing management appropriately.

Power: hypocontractility may be a common cause of Stage II protraction

Consider oxytocin augmentation.

Consider assisted delivery

Passenger: check for malposition, malpresentation, macrosomia

Evaluate the fetal position.

Consider rotation of the fetus

Passageway: is the pelvis adequate? Is there cephalopelvic disproportion?

Evaluate the maternal position: consider having the patient move into different positions such as on hands and knees to change the relative size of the pelvis.

Consider OB/surgical consultation, and plan when to assemble team for Cesarean birth.

[*Low Quality Evidence*], [*Guideline*]

Is the Head Descending?

Prolongation of the second stage of labor beyond an arbitrary time limit is no longer an indication for assisted vaginal or Cesarean delivery. As long as progress is being made and fetal monitoring is Category I or II, the patient can continue pushing [*Low Quality Evidence*].

Assisted Vaginal Delivery Indicated?

If there is no descent for 2 hours despite optimizing labor, an assisted delivery or surgical consult is suggested. Vacuum extraction or mid/low forceps delivery contraindications include:

Vertex is too high.

Clinician is inexperienced.

Fetal distress with inability to do timely operative vaginal delivery

Patient refusal

Note: When using vacuum extraction or forceps application with a suspected macrosomic infant, be aware of the risk of shoulder dystocia [*Low Quality Evidence*].

Intrapartum Fetal Heart Rate (FHR) Monitoring Algorithm Annotations

Continuous Electronic Fetal Monitoring-External (EFM-ext) or EFM-Internal (int) (if needed)

EFM is indicated in all high-risk situations and it may be considered in situations when the auscultatory pattern is unclear. Internal EFM may allow easier patient positioning and promote

patient activity by being less confining than external EFM. Low-risk patients should be encouraged to be as active and mobile as possible.

FHR Pattern Is Predictive of Normal Acid-Base Status?

All obstetrical nurses, nurse midwives, and physicians must achieve competence and confidence in FHR monitoring and FHR pattern analysis. Based on careful review of the available options, a three-tier system for the categorization of FHR patterns is recommended (see table developed by the guideline committee in Annotation #82 in the original guideline document). FHR tracing patterns can provide information on the current acid-base status of the fetus but cannot predict the development of cerebral palsy. Categorization of the FHR tracing evaluates the fetus at that point in time; tracing patterns can and will change [*Low Quality Evidence*].

Definitions

Late Decelerations

Deceleration is delayed in timing, onset-to-nadir if the deceleration is 30 seconds or greater, and there is a gradual decrease and return to baseline.

Early Decelerations

Onset, nadir, and recovery mirror the beginning, peak, and ending of the contraction.

Variable Decelerations

Abrupt decrease in FHR with onset to nadir of deceleration reached in less than 30 seconds, decrease in FHR is 15 seconds or greater and less than 2 minutes in duration.

Variability

Fluctuations in the FHR baseline over a 10-minute window, accelerations and decelerations are not included in the range.

Absent - amplitude range is undetectable.

Minimal - amplitude range is between 2 beats per minute (bpm) and 5 bpm.

Moderate - amplitude range is between 6 bpm and 25 bpm.

Marked - amplitude range is greater than 25 bpm.

Recurrent

Decelerations that occur with 50% or greater of uterine contractions in any 20-minute window.

Sinusoidal Pattern

Cyclic, smooth, sine wavelike undulating pattern in the FHR baseline frequency cycle of 3 to 5 per minute that persists for 20 minutes or longer.

[*Guideline*], [*Low Quality Evidence*]

Assessment and Intrauterine Resuscitation

A persistently Category II or Category III FHR tracing requires evaluation of the possible causes.

Initial evaluation and treatment may include:

Discontinuation of any labor stimulating agent

Administer intravenous fluid bolus

Cervical examination to assess for umbilical cord prolapse or rapid cervical dilation or descent of the fetal head

Changing maternal position to the left or right lateral recumbent position, reducing compression of the vena cava and improving uteroplacental blood flow

Monitoring maternal blood pressure level for evidence of hypotension, especially in those with regional anesthesia (if present, treatment with ephedrine or phenylephrine may be warranted)

Assessment of patient for uterine tachysystole that affects FHR tracing by evaluating uterine contraction frequency and duration

Amnioinfusion - indications for therapeutic amnioinfusion include repetitive severe variable decelerations and prolonged decelerations [*High Quality Evidence*]. Amnioinfusion for thick

meconium is no longer recommended.

Consider obstetrical surgical consultation if bradycardia with minimal or absent variability or prolonged decelerations or both do not resolve. (See Annotation #89, "Emergent Delivery," below)

[Guideline]

Further FHR Assessment Predictive of Normal Acid-Base Status?

Scalp stimulation or vibroacoustic testing may be used for further fetal assessment. A 15-beat-per-minute rise in FHR lasting 15 seconds from the beginning to the end of the acceleration in response to scalp stimulation or to vibration or sound is predictive of normal fetal acid-base status. If the scalp stimulation test or vibroacoustic test response is abnormal, immediate delivery is indicated.

Other tests to assess fetal acid-base status may be helpful if available. This includes fetal scalp sampling for pH. A scalp pH greater than 7.19 is a positive result *[Meta-analysis], [Low Quality Evidence]*.

However, proper FHR pattern interpretation and the response to scalp stimulation or vibroacoustic stimulation can allow the clinician to detect tracings predictive of abnormal fetal acid-base status.

Knowledge of the fetal oxygen saturation is not associated with a reduction in the rate of Caesarean delivery or with improvement in the condition of the newborn *[High Quality Evidence]*.

Emergent Delivery

Tracings predictive of abnormal fetal acid-base status (Category III) indicate the need for emergent delivery. Delivery should be effected by appropriate means, depending on the clinical situation. This may include vacuum extraction, forceps, or Caesarean delivery, depending upon fetal presentation and the expertise of the attending physician(s).

Caesarean delivery should be performed if vacuum extraction or forceps are inappropriate for use.

If a Caesarean delivery is performed, the suitability of a VBAC in a subsequent pregnancy should be discussed with the patient.

The following are indications for Caesarean birth based on abnormal FHR monitoring according to the Minnesota Clinical Comparison and Assessment Project:

- Late decelerations that comprise the majority of contractions over a minimum 20-minute period in the absence of adequate beat-to-beat variability and which do not respond to remedial techniques

- Severe variable decelerations that comprise the majority of contractions over 20 to 60 minutes and that do not respond to remedial techniques

- Severe persistent non-remediable bradycardia

- Scalp pH less than 7.2 or negative FHR acceleration test (confirmation in 15 to 20 minutes recommended)

There may be other combinations or non-remediable patterns that may not meet severity criteria listed above that may be indications for preparation for Caesarean birth. A scalp pH or FHR acceleration test (scalp or acoustic) may help clarify the issue. Consultation or second opinion is suggested.

In the second stage of labor, depending on the judgment and skill of the physician, operative vaginal delivery may be the least hazardous for the mother and child.

If 1-minute Apgar is less than three, or 5-minute Apgar is less than six, cord pH or gases are recommended. Cord pH is a better indicator than APGAR for fetal compromise. A segment of umbilical cord is isolated with clamps and may be stored up to 60 minutes after delivery with reliable umbilical artery pH determination. The segment does not need to be heparinized or placed on ice *[Low Quality Evidence]*.

Definitions:

Following a review of several evidence rating and recommendation writing systems, Institute for Clinical System Improvement (ICSI) has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Crosswalk between ICSI Evidence Grading System and GRADE

ICSI GRADE System		Previous ICSI System
High, if no limitation	Class A:	Randomized, controlled trial
Low	Class B:	[observational]
		Cohort study
	Class C:	[observational]
		Non-randomized trial with concurrent or historical controls
Low		Case-control study
Low		Population-based descriptive study
*Low		Study of sensitivity and specificity of a diagnostic test
*Following individual study review, may be elevated to Moderate or High depending upon study design		
	Class D:	[observational]
Low		Cross-sectional study
		Case series
		Case report
Meta-analysis	Class M:	Meta-analysis
Systematic Review		Systematic review
Decision Analysis		Decision analysis
Cost-Effectiveness Analysis		Cost-effectiveness analysis
Low	Class R:	Consensus statement
Low		Consensus report
Low		Narrative review
Guideline	Class R:	Guideline
Low	Class X:	Medical opinion

Evidence Definitions

High Quality Evidence = Further research is very unlikely to change confidence in the estimate of effect.

Moderate Quality Evidence = Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.

Low Quality Evidence = Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate or any estimate of effect is very uncertain.

In addition to evidence that is graded and used to formulate recommendations, additional pieces of literature will be used to inform the reader of other topics of interest. This literature is not given an evidence grade and is instead identified as a Reference throughout the document.

Clinical Algorithm(s)

Detailed and annotated clinical algorithms are provided in the original guideline document (see the "Guideline Availability" field) for:

- Management of Labor
- Management of Signs/Symptoms of Preterm Labor (PTL)
- Management of Critical Event
- Vaginal Birth after Caesarean (VBAC)
- Management of Labor Dystocia
- Intrapartum Fetal Heart Rate (FHR) Management

Scope

Disease/Condition(s)

Labor, including:

- Preterm labor
- Preterm labor with rupture of membranes (ROM) or bleeding
- Vaginal birth after caesarean
- Labor dystocia

Guideline Category

Evaluation

Management

Prevention

Risk Assessment

Clinical Specialty

Family Practice

Nursing

Obstetrics and Gynecology

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Health Plans

Hospitals

Managed Care Organizations

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To increase the percentage of patients with preterm labor (PTL) of less than 34 weeks who receive antenatal corticosteroids
- To increase the percentage of patients who have procedures that assist in progress to vaginal birth
- To increase the percentage of patients who are assessed for risk status on entry to labor and delivery
- To increase the use of intrauterine resuscitation techniques for fetal tachysystole or Category III heart rate tracings

Target Population

All women who present in labor

Interventions and Practices Considered

1. Management of Labor
 - Triage of symptoms of labor
 - Patient education for reassurance/observation
 - Consideration of labor induction, if appropriate
 - Intrapartum care, including monitoring of fetal heart rate
 - Risk assessment for all patients in active labor
 - Active management of the third stage of labor, including administration of uterotonic agents, controlled cord traction, and uterine massage after delivery of placenta, if appropriate
2. Management of signs/symptoms of preterm labor (PTL)
 - Sterile speculum examination
 - Fetal fibronectin testing
 - Digital cervical examination
 - Transvaginal sonogram
 - Bedside ultrasound if feasible
 - Assessment of contraction pattern
 - Assessment of fetal heart rate and fetal well being
 - Urinalysis, urine culture, and urine drug screening, if appropriate
3. Management of critical events
 - Antenatal corticosteroids STAT/intravenous antibiotics for group B streptococcus
 - Magnesium sulfate
 - Tocolytics
 - Maternal transfer, if possible
 - Broad spectrum antibiotics (ampicillin and erythromycin)
 - Assay of phosphatidyl glycerol in vaginal pool
 - Management of preterm labor with bleeding
 - Deliver for fetal distress and other obstetrical indicators
4. Management of vaginal birth after caesarean
5. Management of labor dystocia

- Evaluation of the potential causes
 - Intravenous fluids
 - Artificial rupture of membranes
 - Reduction or discontinuation of epidural anesthesia
 - Oxytocin augmentation
 - Assessment of fetal head descent
 - Management of protracted labor
 - Assisted vaginal delivery, if indicated
6. Intrapartum fetal heart rate monitoring

Major Outcomes Considered

- Effectiveness of active management of labor in reducing Caesarean deliveries
- Rate and type of delivery including spontaneous vaginal, forceps, or Caesarean delivery
- Maternal and neonatal morbidity and mortality

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

A consistent and defined process is used for literature search and review for the development and revision of Institute for Clinical Systems Improvement (ICSI) guidelines. The literature search was divided into two stages to identify systematic reviews, (stage I) and randomized controlled trials, meta-analyses and other literature (stage II). Literature search terms used for this revision include partograms, induction of labor, expectant management of labor, cervical ripening, active management of labor and oxytocin – from January 2011 through October 2012 in PubMed.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Following a review of several evidence rating and recommendation writing systems, the Institute for Clinical System Improvement (ICSI) has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Crosswalk between ICSI Evidence Grading System and GRADE

ICSI GRADE System	Previous ICSI System

IGSI GRADE System	Previous IGSI System	
High, if no limitation	Class A:	Randomized, controlled trial
Low	Class B:	[observational]
		Cohort study
	Class C:	[observational]
		Non-randomized trial with concurrent or historical controls
Low		Case-control study
Low		Population-based descriptive study
*Low		Study of sensitivity and specificity of a diagnostic test
*Following individual study review, may be elevated to Moderate or High depending upon study design		
	Class D:	[observational]
Low		Cross-sectional study
		Case series
		Case report
Meta-analysis	Class M:	Meta-analysis
Systematic Review		Systematic review
Decision Analysis		Decision analysis
Cost-Effectiveness Analysis		Cost-effectiveness analysis
Low	Class R:	Consensus statement
Low		Consensus report
Low		Narrative review
Guideline	Class R:	Guideline
Low	Class X:	Medical opinion

Evidence Definitions

High Quality Evidence = Further research is very unlikely to change confidence in the estimate of effect.

Moderate Quality Evidence = Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.

Low Quality Evidence = Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate or any estimate of effect is very uncertain.

In addition to evidence that is graded and used to formulate recommendations, additional pieces of literature will be used to inform the reader of other topics of interest. This literature is not given an evidence grade and is instead identified as a Reference throughout the document.

Methods Used to Analyze the Evidence

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

New Guideline Development Process

A work group consisting of 6 to 12 members that includes physicians, nurses, pharmacists, other healthcare professionals relevant to the topic, and an Institute for Clinical Systems Improvement (ICSI) staff facilitator develops each document. Ordinarily, one of the physicians will be the leader. Most work group members are recruited from ICSI member organizations, but if there is expertise not represented by ICSI members, 1 or 2 members may be recruited from medical groups, hospitals, or other organizations that are not members of ICSI. Patients on occasion are invited to serve on work groups.

The work group will meet for 7 to 8 three-hour meetings to develop the guideline. A literature search and review is performed and the work group members, under the coordination of the ICSI staff facilitator, develop the algorithm and write the annotations and footnotes and literature citations.

Once the final draft copy of the guideline is developed, the guideline goes to the ICSI members for critical review.

Revision Process of Existing Guidelines

ICSI scientific documents are revised every 12 to 24 months as indicated by changes in clinical practice and literature. For documents that are revised on a 24-month schedule, ICSI checks with the work group on an annual basis to determine if there have been changes in the literature significant enough to cause the document to be revised earlier or later than scheduled. For yearly reviewed documents, ICSI checks with every work group 6 months before the scheduled revision to determine if there have been changes in the literature significant enough to cause the document to be revised earlier than scheduled.

Literature Search

ICSI staff, working with the work group to identify any new pertinent clinical trials, systematic reviews, or regulatory statements and other professional guidelines, conduct a literature search.

Revision

The work group will meet for 1 to 2 three-hour meetings to review the literature, respond to member organization comments, and revise the document as appropriate.

A second review by members is indicated if there are changes or additions to the document that would be unfamiliar or unacceptable to member organizations. If a review by members is not needed, the document goes to the appropriate steering committee for approval according to the criteria outlined in the "Description of Method of Guideline Validation" field.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Critical Review Process

The purpose of critical review is to provide an opportunity for the clinicians in the member groups to review the science behind the recommendations and focus on the content of the guideline. Critical review also provides an opportunity for clinicians in each group to come to consensus on feedback they wish to give the work group and to consider changes necessary across systems in their organization to implement the guideline.

All member organizations are expected to respond to critical review guidelines. Critical review of guidelines is a criterion for continued membership within the Institute for Clinical Systems Improvement (ICSI).

After the critical review period, the guideline work group reconvenes to review the comments and make changes, as appropriate. The work group prepares a written response to all comments.

Document Approval

Each document is approved by the Committee for Evidence-Based Practice (CEBP).

The committee will review and approve each guideline/protocol, based on the following criteria:

- The aim(s) of the document is clearly and specifically described.

- The need for and importance of the document is clearly stated.

- The work group included individuals from all relevant professional groups and had the needed expertise.

- Patient views and preferences were sought and included.

- The work group has responded to all feedback and criticisms reasonably.

- Potential conflicts of interest were disclosed and do not detract from the quality of the document.

- Systematic methods were used to search for the evidence to assure completeness and currency.

- Health benefits, side effects, risks and patient preferences have been considered in formulating recommendations.

- The link between the recommendation and supporting evidence is clear

- Where the evidence has not been well established, recommendations based on community practice or expert opinion are clearly identified.

- Recommendations are specific and unambiguous.

- Different options for clinical management are clearly presented.

- Clinical highlights and recommendations are easily identifiable.

- Implementation recommendations identify key strategies for *health care systems* to support implementation of the document.

- The document is supported with practical and useful tools to ease *clinician* implementation.

- Where local resource availability may vary, alternative recommendations are clear.

- Suggested measures are clear and useful for quality/process improvement efforts.

Once the document has been approved, it is posted on the ICSI Web site and released to members for use.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is classified for selected recommendations (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate management of labor

Potential Harms

- In February 1997, the U.S. Food and Drug Administration (FDA) alerted practitioners to use caution in the continuous subcutaneous administration of terbutaline sulfate.
- The FDA notified health care professionals that oral and injectable terbutaline should not be used in pregnant women for prolonged treatment (beyond 48-72 hours) of preterm labor because of the potential for serious maternal heart problems and death.
- Augmentation or induction of labor with *oxytocin* increases the risk of uterine rupture though the risk is still low (1% to 2.4%). Oxytocin has also been associated with tachysystole (>75 contractions per 10 minutes).
- When using vacuum extraction or forceps application with a suspected macrosomic infant, be aware of the risk of shoulder dystocia.
- The scarred uterus has an increased potential to rupture. Uterine rupture occurs in between 1/100 and 1/11,000 deliveries depending on whose data one uses and the clinical presentation. The type of scar makes a difference in frequency of rupture and severity of symptoms also. Rupture through a low segment transverse scar is much more likely to go undetected or produce maternal hypovolemia or gradual fetal distress. Complete rupture with expulsion of fetus or placenta is a true obstetric emergency and can lead to maternal or hypovolemic complication, even death, as well as fetal hypoxia and death.
- One disadvantage to electronic fetal heart rate (FHR) monitoring (EFM) is that it leads to higher assisted deliveries and Caesarean birth without an associated neonatal benefit. Compared to intermittent auscultation, EFM is associated with a twofold increase in Caesarean delivery rate for non-reassuring FHR patterns.
- While there are no documented long-term risks to the fetus associated with elective deliveries, there is clear potential for harm and increased cost. The decision to consider an elective induction of labor (IOL) should involve an informed consent discussion including the risks of prolonged labor and possible Caesarean section.

Contraindications

Contraindications

Contraindications

- Contraindications to amniotomy include:
 - Presentation unknown, floating, or unstable
 - Cervix dilated less than 3 cm
 - Patient refuses
- Contraindications to oxytocin augmentation include:
 - Unknown presentation or floating/unstable
 - Patient refusal
 - Inability to monitor contractions adequately
- Relative contraindications to direct, invasive monitoring include human immunodeficiency virus (HIV) maternal infection and certain fetal presentations and conditions that preclude vaginal examinations such as placenta previa or undiagnosed vaginal bleeding
- Vacuum extraction or mid/low forceps delivery contraindications include:
 - Vertex is too high.
 - Clinician is inexperienced.
 - Fetal distress with inability to do timely operative vaginal delivery
 - Patient refusal of transverse fetal lie, placenta previa, vasa previa, active genital herpes simplex virus (HSV) infection, prior classical Caesarean section and umbilical cord prolapse
- Contraindications to elective induction of labor (IOL) include conditions in which a vaginal delivery would be contraindicated including transverse fetal lie, placenta previa, vasa previa, active genital HSV infection, prior classical Caesarean section, umbilical cord prolapse

Qualifying Statements

Qualifying Statements

- The information contained in this Institute for Clinical Systems Improvement (ICSI) Health Care Guideline is intended primarily for health professionals and other expert audiences.
- This ICSI Health Care Guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients and families are urged to consult a health care professional regarding their own situation and any specific medical questions they may have. In addition, they should seek assistance from a health care professional in interpreting this ICSI Health Care Guideline and applying it in their individual case.
- This ICSI Health Care Guideline is designed to assist clinicians by providing an analytical framework for the valuation and treatment of patients, and is not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition.
- The recommendations in this guideline are supported by large controlled studies. The guideline work group would prefer to refer to double-blind studies, but it is not feasible to blind a woman to whether she is having labor or delivery. It is unsafe to blind care clinicians to whether a woman has had a previous Caesarean delivery or not or previous labor and delivery complications. It is also unsafe to blind clinicians to whether persistent non-reassuring heart rate tracings have occurred. Given these limitations, the work group feels confident of the literature support for the recommendations within this guideline. Furthermore, these recommendations are consistent with the latest practice patterns published by the American College of Obstetricians and Gynecologists (ACOG).

Implementation of the Guideline

Description of Implementation Strategy

Once a guideline is approved for general implementation, a medical group can choose to concentrate on

the implementation of that guideline. When four or more groups choose the same guideline to implement and they wish to collaborate with others, they may form an action group.

In the action group, each medical group sets specific goals they plan to achieve in improving patient care based on the particular guideline(s). Each medical group shares its experiences and supporting measurement results within the action group. This sharing facilitates a collaborative learning environment. Action group learnings are also documented and shared with interested medical groups within the collaborative.

Currently, action groups may focus on one guideline or a set of guidelines such as hypertension, lipid treatment, and tobacco cessation.

Implementation Recommendations and Measures

These are provided to assist medical groups and others to implement the recommendations in the guidelines. Where possible, implementation strategies are included which have been formally evaluated and tested. Measures are included which may be used for quality improvement as well as for outcome reporting. When available, regulatory or publicly reported measures are included.

Implementation Tools

Chart Documentation/Checklists/Forms

Clinical Algorithm

Quality Measures

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Related NQMC Measures

Management of labor: percentage of patients with preterm labor who received antenatal corticosteroids prior to delivery.

Management of labor: percentage of patients with protracted labor who are administered oxytocin.

Management of labor: percentage of patients who are assessed for risk status on entry to labor and delivery.

Management of labor: percentage of patients whose oxytocin is discontinued.

Management of labor: percentage of patients who have an IV fluid bolus administered.

Management of labor: percentage of patients whose position is changed to the left or right side to decrease compression of vena cava.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Safety

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Creedon D, Akkerman D, Atwood L, Bates L, Harper C, Levin A, McCall C, Peterson D, Rose C, Setterlund L, Walkes B, Wingeier R. Management of labor. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2013 Mar. 66 p. [113 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2005 Oct (revised 2013 Mar)

Guideline Developer(s)

Institute for Clinical Systems Improvement - Nonprofit Organization

Guideline Developer Comment

The Institute for Clinical Systems Improvement (ICSI) comprises 50+ medical group and hospital members representing 9,000 physicians in Minnesota and surrounding areas, and is sponsored by five nonprofit health plans. For a list of sponsors and participating organizations, see the [ICSI Web site](#)

Source(s) of Funding

- The Institute for Clinical Systems Improvement (ICSI) provided the funding for this guideline. The annual dues of the member medical groups and sponsoring health plans fund ICSI's work. Individuals on the work group are not paid by ICSI, but are supported by their medical group for this work.
- ICSI facilitates and coordinates the guideline development and revision process. ICSI, member medical groups, and sponsoring health plans review and provide feedback, but do not have editorial control over the work group. All recommendations are based on the work group's independent evaluation of the evidence.

Guideline Committee

Committee on Evidence-Based Practice

Composition of Group That Authored the Guideline

Work Group Members: Douglas Creedon, MD (*Work Group Leader*) (Mayo Clinic) (OB/Gyn); Deb Peterson, MD (Affiliated Community Medical Center) (Family Medicine); Leslie Atwood, MD (Allina Medical Clinic) (Family Medicine); Ruth Wingeier, CNM (Central Minnesota Midwifery) (Nurse Midwife); Cherida McCall, CNM (HealthPartners Medical Group and Regions Hospital) (Nurse Midwife); Lori Bates, MD (Mayo Clinic) (Family Medicine); Carl Rose, MD (Mayo Clinic) (Maternal-Fetal Medicine) ; Becky Walkes, RN (Mayo Clinic) (Nursing); Dale Akkerman, MD (Park Nicollet Health Services) (OB/Gyn); Anna Levin, CNM (Park Nicollet Health Services) (Nurse Midwife); Cindy Harper (Institute for Clinical Systems Improvement [ICSI]) (Systems Improvement Coordinator); Linda Setterlund, MA, CPHQ (ICSI) (Clinical Systems Improvement Facilitator)

Financial Disclosures/Conflicts of Interest

The Institute for Clinical Systems Improvement (ICSI) has long had a policy of transparency in declaring potential conflicting and competing interests of all individuals who participate in the development, revision and approval of ICSI guidelines and protocols.

In 2010, the ICSI Conflict of Interest Review Committee was established by the Board of Directors to review all disclosures and make recommendations to the board when steps should be taken to mitigate potential conflicts of interest, including recommendations regarding removal of work group members. This committee has adopted the Institute of Medicine Conflict of Interest standards as outlined in the report Clinical Practice Guidelines We Can Trust (2011).

Where there are work group members with identified potential conflicts, these are disclosed and discussed at the initial work group meeting. These members are expected to recuse themselves from related discussions or authorship of related recommendations, as directed by the Conflict of Interest committee or requested by the work group.

The complete ICSI policy regarding Conflicts of Interest is available at the [ICSI Web site](#)

Disclosure of Potential Conflicts of Interest

Dale Akkerman, MD (Work Group Member)
OB/GYN Physician, Park Nicollet Health Services
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: State Guideline for Prenatal
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Lesley Atwood, MD (Work Group Member)
Family Medicine Physician, Allina Medical Clinic
National, Regional, Local Committee Affiliations: Allina Pregnancy Care Council
Guideline Related Activities: VBAC guideline task force AAFP
Research Grants: None
Financial/Non-Financial Conflicts of Interest: Expert Testimony for LEEP case

Lori Bates, MD (Work Group Member)
Family Medicine Physician, Mayo Clinic
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: None

Research Grants: None

Financial/Non-Financial Conflicts of Interest: None

Douglas Creedon, MD (Work Group Leader)

OB/GYN Physician, Mayo Clinic

National, Regional, Local Committee Affiliations: None

Guideline Related Activities:

Research Grants: None

Financial/Non-Financial Conflicts of Interest: None

Anna Levin, CNM (Work Group Member)

Clinical Nurse Midwife, Park Nicollet Health Services

National, Regional, Local Committee Affiliations: None

Guideline Related Activities: None

Research Grants: None

Financial/Non-Financial Conflicts of Interest: None

Cherida McCall, CNM (Work Group Member)

Clinical Nurse Midwife, HealthPartners Medical Group

National, Regional, Local Committee Affiliations: None

Guideline Related Activities: None

Research Grants: None

Financial/Non-Financial Conflicts of Interest: None

Deb Peterson, MD (Work Group Member)

Family Physician, Affiliated Community Medical Center

National, Regional, Local Committee Affiliations: None

Guideline Related Activities: None

Research Grants: None

Financial/Non-Financial Conflicts of Interest: None

Carl Rose, MD (Work Group Member)

Maternal-Fetal Medicine Physician, Mayo Clinic

National, Regional, Local Committee Affiliations: Minnesota ACOG

Guideline Related Activities: None

Research Grants: Sequenom; Cell-free fetal DNA in maternal circulation to detect fetal aneuploidy (concluded 7/29/11)

Financial/Non-Financial Conflicts of Interest: None

Ruth Wingeier, CNM (Work Group Member)

Clinical Nurse Midwife, Central Minnesota Midwifery

National, Regional, Local Committee Affiliations: None

Guideline Related Activities: None

Research Grants: None

Financial/Non-Financial Conflicts of Interest: None

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Institute for Clinical Systems Improvement (ICSI).

Management of labor. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2011 May. 61 p.

Guideline Availability

Available for purchase from the [Institute for Clinical Systems Improvement \(ICSI\) Web site](#)

. Also available to ICSI members for free at the [ICSI Web site](#)

and to Minnesota health care organizations free by request at the [ICSI Web site](#)

.

Availability of Companion Documents

The following companions are provided to those who access the guideline (see the "Guideline Availability" field):

Management of labor. Executive summary. Bloomington (MN): Institute for Clinical Systems Improvement; 2013 Mar.

Admission for routine labor. Order set. Bloomington (MN): Institute for Clinical Systems Improvement; 2013 Mar. 3 p.

Additionally, Appendix A of the original guideline provides a shared decision-making model.

Patient Resources

None available

NGC Status

This summary was completed by ECRI on December 14, 2005. This NGC summary was updated by ECRI Institute on May 24, 2007 and December 22, 2009. This NGC summary was updated by ECRI Institute on December 23, 2009. This summary was updated by ECRI Institute on March 11, 2011 following the U.S. Food and Drug Administration (FDA) advisory on Terbutaline. This NGC summary was updated by ECRI Institute on September 15, 2011 and on June 10, 2013. This summary was updated by ECRI Institute on September 18, 2015 following the U.S. Food and Drug Administration advisory on non-aspirin nonsteroidal anti-inflammatory drugs (NSAIDs). This summary was updated by ECRI Institute on June 2, 2016 following the U.S. Food and Drug Administration advisory on Opioid pain medicines. This summary was updated by ECRI Institute on October 21, 2016 following the U.S. Food and Drug Administration advisory on opioid pain and cough medicines combined with benzodiazepines.

Copyright Statement

This NGC summary (abstracted Institute for Clinical Systems Improvement [ICSI] Guideline) is based on the original guideline, which is subject to the guideline developer's copyright restrictions.

The abstracted ICSI Guidelines contained in this Web site may be downloaded by any individual or organization. If the abstracted ICSI Guidelines are downloaded by an individual, the individual may not distribute copies to third parties.

If the abstracted ICSI Guidelines are downloaded by an organization, copies may be distributed to the organization's employees but may not be distributed outside of the organization without the prior written consent of the Institute for Clinical Systems Improvement, Inc.

All other copyright rights in the abstracted ICSI Guidelines are reserved by the Institute for Clinical Systems Improvement, Inc. The Institute for Clinical Systems Improvement, Inc. assumes no liability for any adaptations or revisions or modifications made to the abstracts of the ICSI Guidelines.

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouse® (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the [NGC Inclusion Criteria](#).

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.